MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

BST1034 – STATISTICS FOR MANAGERS

(All sections / Groups)

02 JUNE 2016
2:30 p.m. – 4:30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 7 printed pages excluding the cover page, with 4 questions only.

2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Students are allowed to use scientific calculators (without restriction).

4. All necessary workings must be shown and please write all your answers in the answer booklet provided.

Question 1:

a. The following data reports the rentals (in RM) for a sample of twelve apartments around MMU Melaka in December last year.

590 600 520 650 700 800 680 700 840 660 780 760

i. Calculate the mean of the data. (3 marks)
ii. Calculate the median of the data. (3 marks)
iii. Describe the shape of the data. (2 marks)
iv. Calculate the coefficient variation of the data. (6 marks)

b. The online transaction records of a bank show that 4% of its customer electronic fund transfers have errors. If a random sample of nine customers is selected, what is the probability that
i. no customer will make mistake in online fund transfers. (2 marks)
ii. at least two customers will make mistakes in online fund transfers. (3 marks)

c. The average number of delayed flights of a local airline is seven delays per week. Find the probability that
i. there will be no flight delay in a particular week. (2 marks)
ii. there will be less than two flight delays in a particular day. (4 marks)

(Total: 25 Marks)

Question 2:

a. The number of defaulted loans reported in ten branches of a bank in this year is as follows:

52 51 70 69 88 73 94 96 78 67

i. Construct a 98% confidence interval for the average number of defaulted loans in all bank branches. (8 marks)

ii. If the average number of defaulted loans reported in all branches of the bank is 68 cases last year. Test at 5% level of significance whether the average number of defaulted loans reported has increased this year. (8 marks)

b. An educationist would like to find out whether students who are attending English tuition class perform better than those students who do not attend English tuition class in a national English test. A random sample of 61 students having English tuition scored an average of 72 marks, while a random sample of 82 students not having English tuition scored an average of 67 marks in the test. If the population standard deviation of the English test scores of students having and not having English tuition is 11 marks and 14 marks respectively, can we conclude that the students who are attending English tuition class perform better than those students who do not attend English tuition class in the test at 1% significance level?
(9 marks)

(Total: 25 Marks)

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Question 3:

a. The engineer of TNB is analyzing the energy usage in four different towns (A, B, C, and D). The descriptive statistics and partially completed analysis of variance table of the average monthly electricity consumption (in kilowatt-hour, kWh) for different towns are reported in the following tables:

SUMMARY

Town	Count	Mean	Variance
A	954	506	21.14
B	879	357	14.76
C	687	482	18.27
D	779	395	10.35

ANOVA

Source of Variation	*SS*	*df*	*MS*
Between Groups	150.5196	***	***
Within Groups	***	3296	***
Total	***	3299	

i. Compute the sum of squares within (*SSW*) the groups and hence complete the ANOVA table. (5 marks)

ii. By assuming that the populations have equal variances and are normally distributed, can the engineer conclude that there is a difference in the energy usage in different towns at the 2.5% significance level? (8 marks)

b. A production manager in a plantation company would like to find out whether there is a relationship between the average temperature in oil palm plantation (rounded to the nearest degree Celsius, $^{\circ}C$) and the fresh fruit bunches (FFB) yield (in metric ton/hectare, MT/ha). The related information of fifty randomly selected oil palm plantations is shown in the following table:

FFB yield (MT/ha)	Temperature ($^{\circ}C$)		
	22 – 26	27 – 31	32 – 35
3.1 – 4.0	8	3	7
4.1 – 5.0	6	6	4
5.1 – 6.0	5	9	2

Is the average temperature and fresh fruit bunches yield associated at the 5% significance level? (12 marks)

(Total: 25 Marks)

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Question 4:

a. Research has shown that the mean latex yield (in grams per tree per tapping, GTT) of rubber trees is affected by the amount of rainfall (rounded to the nearest inches) in the area in which the rubber trees are planted. The following data are collected from a random sample of twelve distinct rubber plantations:

Rainfall (in inches)	214	198	89	96	87	99	152	108	68	115	207	178
Latex yield (in GTT)	90	89	65	75	66	75	81	78	59	76	97	88

i. Compute the coefficient of correlation. (3 marks)
ii. Find the regression line of the mean latex yield. (5 marks)

b. The following are the partially completed output of the total sales of a company regressed on four main factors, that is product, place, price and promotion:

Source of Variation	*SS*	*df*	*MS*
Regression	***	4	**
Residual	49186.56	**	**
Total	62032.84	68	

Variable	*t Stat*
Product	3.2581
Place	1.6017
Price	–3.3755
Promotion	3.4654

i. Complete the ANOVA table. (3 marks)
ii. Test whether the regression model is statistically significant at 5% significance level. (8 marks)
iii. Would you consider omitting any variable at 1% significance level? Why? (6 marks)

(Total: 25 Marks)

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APPENDIXES:

I. STATISTICAL FORMULAE

A. DESCRIPTIVE STATISTICS

Ungrouped Data:

Sample Mean, $\bar{x} = \frac{\sum x}{n}$ Sample Standard Deviation, $s = \sqrt{\frac{\sum x^2}{n-1} - \frac{(\sum x)^2}{n(n-1)}}$

Grouped Data:

Sample Mean, $\bar{x} = \frac{\sum fx}{\sum f}$ Sample Standard Deviation, $s = \sqrt{\frac{\sum fx^2}{\sum f - 1} - \frac{(\sum fx)^2}{\sum f(\sum f - 1)}}$

$$\text{Median} = L_m + \left[\frac{\left(\frac{\sum f}{2} - F_{m-1} \right)}{f_m} \right] c \qquad \text{Mode} = L_m + \left[\frac{(f_m - f_{m-1})}{2f_m - f_{m-1} - f_{m+1}} \right] c$$

B. PROBABILITY DISTRIBUTION

Poisson Probability Distribution

If X follows a Poisson Distribution P (λ) where $P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$

then the mean = E(X) = λ and variance = VAR(X) = λ

Binomial Probability Distribution

If X follows a Binomial Distribution B(n, p) where $P(X = x) = {}^nC_x p^x q^{n-x}$

then the mean = E(X) = np and variance = VAR(X) = npq where $q = 1-p$

Normal Distribution

If $X \sim N(\mu, \sigma)$ where E(X) = μ and VAR(X) = σ^2, then $Z = \frac{X - \mu}{\sigma}$

C. HYPOTHESIS TESTING

One Sample Mean Test

Z-test: $Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$ *t*-test: $t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$

One Sample Proportion Test

$$Z = \frac{p - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$$

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C. HYPOTHESIS TESTING

Two Sample Mean Test

***Z*-test:** $$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

***t*-test:** $$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_p\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad \text{where} \quad s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

Two Sample Proportion Test

$$Z = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\bar{p}(1 - \bar{p})\left[\frac{1}{n_1} + \frac{1}{n_2}\right]}} \quad \text{where} = \bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

D. ANALYSIS OF VARIANCE

$$SST = \sum_{i=1}^{k}\sum_{j=1}^{n_j}\left(X_{ij} - \bar{\bar{X}}\right)^2 \qquad SSB = \sum_{i=1}^{k} n_i\left(\bar{X}_i - \bar{\bar{X}}\right)^2$$

$$SSW = \sum_{i=1}^{k}(n_i - 1)s_i^2 \quad \text{or} \quad SSW = \sum_{i=1}^{k}\sum_{j=1}^{n_j}(x_{ij} - \bar{x}_i)^2$$

E. CHI-SQUARE ANALYSIS

Expected cell frequencies for Independent Test: $$e_i = \frac{row\ total \times column\ total}{n}$$

Chi-Square test statistic: $$\chi^2 = \sum \frac{(o_i - e_i)^2}{e_i}$$

o_i = observed frequency in a particular cell

e_i = expected frequency in a particular cell

F. REGRESSION ANALYSIS

Correlation Coefficient: $$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Simple Linear Regression: $Y = a + bX$ where $$b = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}}$$ and $a = \bar{y} - b\bar{x}$

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G. INDEX NUMBERS

Simple Price Index $P = \frac{p_t}{p_0} \times 100$	**Laspeyres Quantity Index** $P = \frac{\sum p_0 q_t}{\sum p_0 q_0} \times 100$
Simple Aggregate Price Index $P = \frac{\sum p_t}{\sum p_0} \times 100$	**Paasche Quantity Index** $P = \frac{\sum p_t q_t}{\sum p_t q_0} \times 100$
Laspeyres Price Index $P = \frac{\sum p_t q_0}{\sum p_0 q_0} \times 100$	**Fisher's Ideal Price Index** $\sqrt{(\text{Laspeyres Price Index})(\text{Paasche Price Index})}$
Paasche Price Index $P = \frac{\sum p_t q_t}{\sum p_0 q_t} \times 100$	**Value Index** $V = \frac{\sum p_t q_t}{\sum p_0 q_0} \times 100$

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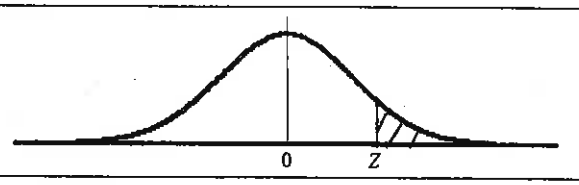
II. STATISTICAL TABLE

Table 1

The Upper Tail Area Under the Standard Normal Curve



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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